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SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports\*  
for  
SOIL CONSERVATION SERVICE RESEARCH \*\*  
MARCH 1950

EROSION CONTROL PRACTICES DIVISION

Weed Control - T. S. Aasheim, Havre, Montana.-"Chemical fallow worked out very satisfactorily this year. Some of the plots required only one spray application of 2,4-D plus one sub-tillage operation. Plots which were infested with green foxtail required two tillage operations in addition to the one spray application. All cultivated fallow required four tillage operations for weed control.

"Plots in fallow in 1949 which were sub-tilled immediately after harvest in 1948 were more free from green foxtail than plots which were not fall tilled. This difference was not too noticeable until the time of the last fallow operation; at this time the plots which had been fall tilled were nearly free from weeds while the sub-tilled plots which were not fall tilled were quite green with this particular weed.

"There appeared to be little difference in the weed infestation of plots in crop.

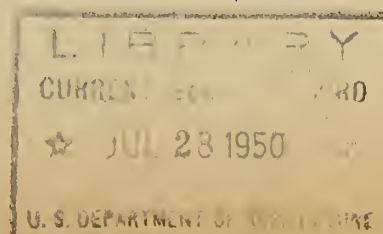
"Green foxtail was difficult to control with sub-tillage this year as has been the case in previous years..

Crop Yield - The yield of wheat on fallow ranged from 14.5 bushels per acre on subtilled fallow to 18.7 bushels per acre on moldboard plowed fallow. This is the greatest spread in yield which has been obtained between methods of fallow at this location since this Demonstration Farm was started in 1940. A possible explanation for this is that the seed was planted deeper in the plowed fallow than in the other types and as a result was placed more often in moist soil.

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"When this field trial was reorganized in 1948 the plots were reduced to half their former size. Where there originally were 24 plots there are now 48. From 1940 through 1947 some of these plots were in a corn-wheat rotation or an idle-wheat rotation. These plots were put into fallow for the first time in 1948. Soil samples taken in the spring of 1949 from these plots had less moisture than samples taken from fallow plots which had been in a wheat-fallow rotation during that same period. When yields were taken this fall it was discovered that these plots did not yield as well as plots which had been in a crop-fallow system. Since the crop yield on these plots appeared to be affected by this previous cropping history they were not included in the average of the treatments. For this reason six of the treatments have only two plots included in the yield, test weight and protein averages. The six plots which were in fallow for the first time in 1948 averaged 12.8 bushels per acre while the eighteen plots which have been in a fallow-crop system since 1940 averaged 15.3 bushels per acre.

"Wheat on chemical fallow yielded more than wheat on ordinary sub-tilled fallow which was seeded with the same type drill. The oneway with seeder attachment was used on all chemical fallow because of the amount of stubble on the surface.

Quality of Grain - "Protein content of wheat produced was about the same on all methods of fallow. Wheat produced on chemical fallow tended to run the lowest in protein content but in general the differences were less than they have been in previous years. Apparently with a yield no higher than was obtained this year there was sufficient nitrogen available on sub-tilled fallow to meet the demands of the crop.

"The following table summarizes crop yield, straw yield, test weight and protein content of wheat produced on the different methods of fallow this year.

Plot Number	Treatment	Grain Yield (Bus.)	Straw Yield (Lbs.)	Test Wt. (Lb.)	Percent Protein
1-4	M.B. Plow	18.7	1616	59.5	15.4
2-25	Oneway - Rodweeder	16.6	1503	59.8	15.4
3-40	S. S. Oneway Seeder	15.1	1292	59.2	14.9
5-13	Chem. Spray-Fall Chisel	15.8	1441	59.6	14.8
6-14	Chem. Spray	17.4	1479	59.5	14.7
26-39	S. S. Fall Chisel	14.5	1300	59.4	15.3
27-37-41	S. S.	14.5	1297	60.5	15.5
28-38-42	S. S. in Fall - S.S.	No fall tillage Fall of 1947.			

S. S. - Sub-surface.

Six treatments have only two plots included in the average because of the reasons explained in the text.

Number of Tillage Operations - "In 1948 all cultivated fallow required four tillage operations except fall chiseled plots which required five. The chemical fallow plots were sprayed twice and subtilled once. The subtilling was done on July 27 which was too late because wild oats had already headed. The one tillage operation was necessary to kill wild oats, green foxtail,



volunteer wheat and wild buckwheat. Spraying killed a lot of the wild buckwheat but a lot of the plants survived both sprayings. Spraying was done with a buffalo turbine sprayer, using 2 gallons of diesel fuel and roughly 1 pint of 2,4-D in the ester formulation per acre.

"In 1949 cultivated fallow again received four cultivations except the chiseled plots which received the chiseling operation in addition to the four tillage operations. The chemical fallow received one spraying only, three plots received one cultivation and three received two cultivations. In plots in which there was no green foxtail one spraying and one tillage operation controlled the weeds successfully."

A Laboratory Study of Erodibility in Relationship to the Specific Gravity of Soils was Completed - A. W. Zingg, Manhattan, Kansas.-"Wind tunnel tests were made on plots at the Amarillo Experiment Station during the week of March 20-24. Most erodible of the plots studied were those planted to sorghum in 1949. During the winter months the quantities of sorghum residue and their resultant resistance to air flow in the tunnel was decreased by approximately one-half. This is due to the shattering and removal of leafy material over the winter months. Accompanying increases in soil removal by the wind tests was also noted. Approximately 200 pounds of soil per acre was removed by a surface drag of 4000 pounds per acre in November of 1949. Comparable losses for the spring tests were approximately 1500 pounds per acre. The erodible soil fractions  $<0.42$  mm. in diameter also increased during the winter period. In November, 1949, fractions less than this size averaged 27 percent. A comparable figure for the spring of 1950 is 36 percent. The ability of the soils to resist wind force in both the fall and spring tests appears to be associated with the immediate surface condition of the soil. The soil characteristic which has governed the amount of removal is a thin surface crust. In the tests of November, 1949, wind forces did not break the crust, but removed a small amount of fine material from its surface. In March of 1950, this crust had diminished in thickness and the forces of wind and soil removal caused it to disintegrate on a small portion of the test surfaces. The result was a wide variation in soil loss for individual tests depending upon the extent of crust breakup. To overcome this variability 5 tests were made on each of several plots.

"Studies of soil structure and residue conditions accompanying the much-publicized dust storm occurring in east central Kansas on March 26 were made in the Salina area. Most of the movement occurred on fields recently seeded to oats. In the main, they had relatively smooth surface conditions and little residues. Their vulnerability is considered to be of a temporary nature."

Soil Losses in Relation to Conservation Practices - Hugh C. McKay, St. Anthony, Idaho.-"The soil loss was extremely heavy this year from the dry farm lands in southeastern Idaho. The ground was frozen and the runoff came in a 3-4 day period with erosion losses from 5 tons per acre up to 150 tons per acre. The evaluations surveys made this spring clearly indicate that one conservation practice only on a farm will not completely control erosion. It is going to take a combination of stubble mulch, crop rotation, strip cropping where adapted, and rough tillage to control erosion in critical erosion years such as this. Some evaluations surveys were made

in the Pocatello work group with Harold Tower, Regional Agronomist. Several fields were gone over that included strip cropping, crop rotations and some with no conservation practices for a check and erosion measurements made. The following results were obtained.

<u>Farmer</u>	<u>Conservation Practices</u>	<u>Soil Loss</u>
Johnson	Strip Cropping Wheat Fallow 100 foot strips No rotation Fair Stubble Mulch 500 lbs. per acre (Slope 15%, capability 4) Not contour seeded.	Average of Fallow strips 50 tons 1/2 field in stubble strips cuts loss in field losses to 25 tons.  Deposition in stubble strip considerable, cut soil loss for field to 18 tons per acre.
Munson	Strip Cropping Wheat Fallow, Sweet clover 50 - 100 foot strips Very good stubble mulch. 1000 to 1200 lbs. per acre. (Slope 12%, capability 3) Not contour seeded.	Average of fallow strip 10 tons. 1/2 field in stubble strips cuts loss to 5 tons. Deposition in stubble strips cuts field loss to 4 tons per acre.
Whitehead	Sweet Clover crop rotation. No strip cropping. Good sweet clover residue mulch. 800 lbs. per acre. Not contour seeded.	Soil loss 8 - 10 tons per acre.
Miller (Check field)	Contour tilled and seeded. No crop rotation, strip cropping, or stubble mulch. (Slope 15%, capability 4)	Average soil loss 118 tons per acre.

"The above data clearly shows the value of conservation practices in reducing erosion. It also shows that one conservation practice alone will not control erosion. The use of a sweet clover crop rotation alone showed up much better than was expected but there was still some soil loss.

"It is felt that as much of the above type of evaluation data as possible should be collected in cooperation with the operations division, so that we can determine how the various conservation practices are reacting under different soil and slope conditions in the field."

Depth of Topsoil in Relation to Crop Yield - O. R. Neal, New Brunswick, New Jersey.—"Field studies of the influence of depth of remaining surface soil on crop yields were continued during the 1949 growing season. A summary of the results of a large number of measurements for several different crops during the past 9 years is shown in the following table. Each datum represents the average yield for all farms for the crop and year indicated.

Summary of crop yields from eroded and uneroded areas on New Jersey farms

Crop	Year	Yield	
		Eroded (1) Bu./A.	Uneroded (2) Bu./A.
Potatoes	1949	189	340
Potatoes	1941 to 1949 incl.	216	317
Corn	1949	47	77
Corn	1943 to 1949 incl.	41	67
Wheat	1949	16	46
Wheat	1944 to 1949 incl.	18	38
Barley	1944 and 1945	26	54
Oats	1944	21	32
Rye	1944 and 1945	11	37
Soybeans	1944	4	18
Alfalfa	1944 and 1945	2.0 tons	3.3 tons
Asparagus	1944	323 lbs./A.	728 lbs./A.

- (1) "Eroded" indicates areas having less than 6 inches of surface soil remaining.  
 (2) "Uneroded" indicates areas having 6 inches or more of surface soil remaining.

"Two of the 1949 potato measurements were made where irrigation was applied equally on both the slightly eroded and the severely eroded areas. The slightly eroded areas produced 415 bushels of potatoes in comparison to 223 bushels from the severely eroded areas, despite equal water application on each area. One measurement was made where the potatoes were planted and cultivated on the contour and irrigated; here the slightly eroded areas produced 424 bushels of potatoes in comparison to 320 bushels per acre from the severely eroded areas. These data place added emphasis upon the importance of conservation of the surface soil for the maintenance of soil productivity."

Effects of Winter Conditions on the Physical Condition of Soil - C. S. Slater, Beltsville, Maryland.—"Tubs of soil, alike last fall but subjected over winter to differences in moisture tension and insulative protection, are now showing marked differences. Soils with both free drainage and insulative protection appear to be in excellent physical condition. Soils that had either free drainage or insulative protection appear to be in good condition. Soils that were subjected to excessive moisture and were at the same time without insulative protection appear to be in poor condition. They have slumped badly and appear to be puddled. These effects have become more marked during the 'freeze and thaw' weather of the past few weeks. Quantitative data have not been taken yet."



Soil Friability or Tilth in Relation to Soil Aggregation - D. S. Hubbell, State College, N. M.—"As has been suggested in previous reports, losses in soil friability or tilth may not be reflected by total aggregation, although a redistribution of aggregate size classes may occur. This behavior has been noticed in the field and efforts have been made to account for it. Laboratory studies, some of which have been previously reported, indicate that hardness in a soil which maintains a high degree of aggregation is probably due to a minute amount of dispersed clay. The amount of clay in dispersion is too small to bring about a noticeable reduction in total aggregation but as may be seen in tables 1 and 2, increments of .2 of one percent or less is sufficient to harden a soil by tremendous amounts. In fact, up to 2 percent, the relationship appears to be a straight line function. Table 1 shows differences in degree of hardness when 2-micron clay is added to a soil as dispersed clay and as a flocculated clay. Table 2 shows what probably happens in a field soil when certain factors involved in common tillage practices are applied to small quantities of soil.

"It should be pointed out that differences in dispersion are not always apparent after a puddled soil has dried out. To find these differences, the soils in question must be analyzed before drying. The reason for this is easily explained by colloidal behavior in soil physics.

Table 1.--Effect of dispersed and flocculated clay on crushing strength.

Soil Type	% Dispersed Clay						% Flocculated Clay					
	0.0	0.2	0.4	0.6	0.8	1.0	0.0	0.2	0.4	0.6	0.8	1.0
Crushing Strength*												
Sand 100% Pure	0.0	0.9	1.7	3.1	4.1	5.4	0.0	0.7	1.5	1.8	2.1	2.6
Silt 97% Pure	7.6	9.6	11.7	11.7	12.2	12.8	8.5	8.9	9.6	9.6	10.4	11.0
Soil Aggregates (mixed sizes)	3.1	3.7	4.0	4.8	5.1	6.0						

\* Resistance to crushing by 12 gram briquette. Expressed in thousands of grams.

Table 2.--Effect of simulated field practices on total dispersion, total aggregation and crushing strength.

Soil: Gila Clay	Total	Total	Crushing
Treatment	Dispersion	Aggregation	Strength
Control: Optimum Moisture (incubated 60 days)	1.76%	52.3%	15.3 (1000 gr.)
Saturated & Puddled after Inc.	1.89	53.1	41.2
Knifed after Incubation	2.30	50.1	55.6
Wet Compacted after Incubation	2.41	49.0	64.1
Saturated & given wave actions after incubation	2.01	52.1	18.3
Saturated & fast dried after incubation	1.74	53.0	18.3



Winter Grazing - B. H. Hendrickson, Watkinsville, Ga.-"Of a series of 11 upland pastures in use during the past year, all of which were treated alike as to fertilization, the 2 leading pastures produced over half of their total year's grazable growth during the 4-month November 1949-February 1950 'winter grazing' period.

"Based upon air-dry weights of pasture cage cuttings, the best 2 pastures produced 2.80 and 1.55 tons per acre, respectively, during the past winter period. These are located on Class IV and Class VII land, and are steep badly eroded bench terraced slopes.

"In kudzu for 11 and 9 years, respectively, the kudzu in the former pasture was grazed down, the pasture was fertilized and sown to oats and crimson clover in early September of 1949. Ryegrass, vetch and Caley peas volunteered. The oats and ryegrass produced most of the winter grazing.

"The latter pasture, similarly grazed down in early September, received the same rate of fertilization namely 500 pounds per acre of 4-8-6, but no tillage nor any additional seedings. Brome rescue grass, vetch and Caley peas volunteered. The grass produced practically all of the winter grazing.

"Of the 9 other pastures, all on 'better land,' none exceeded 1.50 tons per acre of cuttings during the winter period, although all were good pastures yielding over 1.00 ton per acre, each.

"The point is, that what was idle land 12 years ago, and still is too rough and steep for cultivation, produced the most winter grazing at very low cost, - thanks mainly to the long kudzu build-up. The same pastures provide kudzu grazing during the summer."

Some Infiltration Tests - O. W. Beale, Clemson, S. C.-"Infiltration measurements using simulated rainfall were made on soils in truck farming areas near Charleston, S. C. and peach orchards near Spartanburg, S. C., to furnish information for predicting the application rates that could be used with sprinkler irrigation systems on these soils. Infiltration rates of freshly cultivated soils at the end of 1 hour of rainfall ranged from 0.48 to 1.05 inches per hour for truck soils and 0.11 to 0.60 inch per hour for the peach orchard soils. Cecil sandy loam with a good growth of ladino clover had an infiltration rate in excess of 2.26 inches per hour at the end of 60 minutes rainfall while the same soil in a clean-tilled condition in an adjoining tree row interval had an infiltration rate of 0.60 inch per hour.

"Soils having highly oxidized, strongly flocculated B horizons as in the case of Cecil, Lloyd and Norfolk soils had relatively low available water capacities, usually about 0.10 inch per inch of depth, while soils with the clay in a more dispersed condition had much higher available water capacities. Iredell B horizon with a value of 0.315 inch per inch of depth had the highest available water capacity of any soil tested."

Runoff and Soil Loss - O. E. Hays, LaCrosse, Wisconsin.-"Extreme difficulty was experienced at each of the three locations in keeping runoff measuring equipment functioning properly during the alternate freezing and thawing. The inclined wheel sampler and the aliquot sample pipes at Owen froze solid with ice as the temperature dropped at night. Ice froze in terrace channels in many cases making the terraces ineffective. We plan to make an ice breaker for the Cletrac tractor for use in the future under similar conditions.

"During the past four years, some of our highest soil loss has occurred during the spring thaws. Clyde Bay reports from Madison on the results from a gentle rain which fell on March 25-26. For the two days, the total rainfall was 0.66" with a maximum intensity of 0.20" in ten minutes. There was a variable amount of snow on the plots and the soil was thawed to a depth of 3 to 5 inches. The loss from a plowed plot was 0.70" runoff and 1.75 tons of soil per acre; from a winter wheat plot 0.60" runoff and 0.91 tons of soil loss per acre. The winter wheat plot lost only about one-half as much soil as the plowed plot. Frost measurements at Madison on April 1 show 5 to 7 inches of unfrozen soil and then frozen soil to about 24 inches."

Seasonal Runoff on Claypan Soils - D. D. Smith, Columbia, Missouri.-"The 40 percent of the annual average rainfall at McCredie that has occurred during the over-winter period (October 8 to April 27) has caused 50 percent of the runoff from a 3-year rotation of corn-wheat-meadow. The cover for two of the over-winter periods was meadow, and for the third, young wheat. With rotations not having living winter covers the proportion of runoff during this period was even higher.

"That 30 percent of the rainfall appears as runoff during the over-winter period in comparison to 20 percent during the corn and soybean period is an important factor to be considered in planning cropping programs for flood control on claypan soils. Soil and crop management systems that are not designed for maximum transpiration during the over-winter period can be potential contributing sources of winter and early spring floods even though erosion may be controlled by dormant sod, dead crop residue, or terracing. These claypan soils act as a water jug with an extremely slow leak out of the bottom and thence the water must be pumped out by plant transpiration between rains if excessive spilling-over or runoff is not to occur. Selection of crop and the soil treatment to enable it to grow during this period offers a practical solution.

"A summary of 4 years data on reclamation of severely eroded land indicates five points: (1) All of these areas are deficient in plant nutrients. Adequate fertility is necessary to reclaim, rebuild, and put them to productive use. (2) Runoff and erosion must be controlled to protect the investment in reclamation efforts. (3) Pasture is a satisfactory and desirable use for this land. (4) With proper management, these areas can become productive units of the farm. A 5-1/2 acre area at the experimental farm has paid the total costs of reclamation, soil treatment, and farming and left an annual average of \$32.69 per acre to pay rent and management costs. (5) It would be economically more sound to install erosion control measures while a good depth of surface soil remains."



Green Weight Yields of Certain Winter Legumes - E. C.

Richardson, Auburn, Alabama.--"Plantings of several different possible reseeding legumes were made about the middle of October 1949 on the main station at Auburn and on the Piedmont Substation at Camp Hill. Inoculated seed were broadcast on the surface and covered by rolling with a culti-packer.

"In late March green-weight yield determinations were made by clipping and weighing the material from definite areas. Results of these determinations are shown in table 1.

Table 1.--Green-weight yields of winter legumes. March 1950.

	Camp Hill, Ala. Cecil Soil	Auburn, Ala. Norfolk Loamy sand	Average
	Lb.	Lb.	Lb.
Hairy peas	15,369	20,731	18,050
Smooth vetch	13,904	22,909	18,407
Grandiflora vetch	12,719	28,314	20,517
Woolly pod vetch	13,225	--	13,225
Crimson clover	16,856	37,510	27,183
Subterranean clover	17,023	25,813	21,418
Bur clover	9,883	19,682	14,782
Button clover	--	27,184	27,184

"As a result of the unseasonably warm weather, winter crops all made good growth throughout the winter, resulting in higher yields than are normally obtained.

"Crimson clover produced the highest tonnage of green material closely followed by subterranean clover. The other crops included in the test yielded about the same tonnage of green material.

"Broadleaf Caley or hairy peas, a selection made by the Nursery at Thorsby, and Caley peas from commercial sources were planted in comparable plots at Auburn and Camp Hill.

"The Nursery selection yielded 23,655 pounds of green material as compared to 12,481 pounds of green material for the Caley peas from commercial sources (Table 2).

Table 2.--Green-weight yields from comparative plots with the same fertilizer treatments and cultural practices.

	Camp Hill, Ala. Cecil soil	Auburn, Ala. Cecil soil	Average
	Lb.	Lb.	Lb.
Caley or Hairy peas (Nursery selection)	27,346	19,965	23,655
Caley peas from commercial sources	12,826	12,136	12,481



Stubble Mulch Studies - C. J. Whitfield, Amarillo, Texas.-"At the end of March, very little green foliage remained on either the continuous wheat or the wheat on fallow plots. With the drying up of the foliage the greenbugs, which were present in large numbers and doing extensive damage earlier in the month, had been largely eliminated. From 0.8 to 1.5 inches of available water remains in the top 4 feet of soil of the continuous wheat plots, and from 2.2 to 2.5 inches in the case of the wheat-on-fallow plots. No moisture was received during March and whether a worthwhile portion of the wheat crop will revive should rains occur soon is a matter of conjecture.

"Some sieving of surface soil from the stubble mulch plots was carried out with a rotary sieve during the last week in March to determine the effect of the method of tillage and of the cropping system on the erodibility of the soil by wind as reflected by the relative proportions of clods or aggregates of varying sizes. As a matter of interest, the percentage of the soil in the form of the three finest or most erodible fractions is given.

Clod Structure of Soil From Stubble Mulch Plots on March 24, 1950

Tillage	Stage of Cropping	Clod Structure by Dry Sieving			
		<.42 mm. 0/0	.42-.84 mm. 0/0	.84-2.0 mm. 0/0	Total % < 2 mm.
Oneway	Continuous wheat	37.3	25.7	14.5	77.5
Subtillage	" "	41.0	24.6	11.5	77.1
Hoeme	" "	49.1	29.2	9.4	87.7
Oneway	Wheat-on-fallow	37.6	16.9	10.8	65.3
Subtillage	" " "	39.1	14.5	9.4	63.0
Delayed	" " "				
Subtillage	" " "	40.0	18.6	12.3	70.9
Hoeme plow	" " "	33.9	23.4	10.6	67.9
Oneway	Fallow	43.1	19.7	10.2	73.0
Subtillage	"	42.5	21.7	10.2	74.4
Delayed sub-	"				
tillage	"	33.6	20.0	11.7	65.3
Hoeme plow	"	51.2	25.6	9.3	86.1

"C. E. Van Doren (The effect of cloddiness of soils on their susceptibility to wind erosion. - Journal American Society of Agronomy. Vol. 36, No. 10, October 1944) has shown that the tendency of the soil to blow is correlated with the percentage of particles under 2 mm. in size. In general, it appeared that the plots which had been producing wheat on a fallow system had a smaller proportion of particles under 2 mm. in size than did the plots in continuous wheat and therefore would be expected to be less erodible. The Pullman clay loam soil, when unprotected by surface residues, has been found to be subject to wind erosion when the proportion of the soil in the form of aggregates under 2 mm. in size exceeds 65 percent."

# DRAINAGE AND WATER CONSERVATION

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio. - "After a mild winter, the weather turned unseasonably cold in March. The wheat ground was frozen 6 days more and to greater depths than the average for this month. Mr. Dreibelbis has prepared a summary of frost observations on wheatland for 10 years as given below:

Item	Period	Dec.	Jan.	Feb.	Mar.
Average number of days of frost in ground	1939-49	19	23	21	11
	1949-50	10	9	10	17
Average depth of frost penetration (inches)	1939-49	1.47	2.10	1.64	.80
	1949-50	.74	.40	.52	.96

"Mr. Schiff reports the completion of a paper 'Surface Detention, Rate of Runoff, Erosion, and Land Use Relationships on Small Watersheds.' Some of the highlights of this paper follow:

- For a given rate of runoff the depth of surface detention decreased for successive rises of a multiple peak hydrograph. Since lag time was accounted for, reasons for such differences probably include:
  - A decrease in resistance to flow caused by the removal of some loose soil and residue; and,
  - The formation of rivulets for flow increased the hydraulic radius by reducing the wetted perimeter.
- For identical runoff rates the average depth of surface detention increased as the density of cover increased.
- Velocities were lower on contour cultivated watersheds than on straight-row watersheds.
- Velocities of surface-detention flow computed for watersheds compared favorably with velocities measured on plots, particularly for bare soils and furrows. Velocities of surface-detention flow decreased as the density of cover increased."

Hydrologic Studies - J. A. Allis, Central Great Plains Experimental Watershed, Hastings, Nebraska. - "Winter wheat is showing up better than expected; although there has been considerable winter kill, probably due to drought conditions. A mixture of annual sweet clover, biannual sweet clover, and partridge pea was seeded in the wheat watersheds in March, which should increase future yields according to information that has been obtained by Dr. Duley and Professor Russel.

"Dust storms on March 7, and again on March 26, were very severe. On March 7, the 24-hour average wind velocity was 35.6 miles per hour and the highest average velocity for several hours was 60 miles per hour. On March 26 the average 24-hour

wind velocity was 28.6 miles per hour, however, the dust in the air was greater than on the 7th. Visibility was reduced and it was necessary to drive with lights on during the day. Several accidents were attributed to the dust.

"In March, 1950, only 0.24 inch of moisture was received at the station. Soil moisture on the area is generally lower this year than at any time since 1944 as expressed in the following tables:

Table 1.--Percent of soil moisture on cultivated land  
March 20-24, 1944 - 1950

	Ave. percent top 1 foot	Ave. percent top 3 feet	Ave. percent top 6 feet
1944	16.4	13.5	13.5
1945	24.6	22.9	19.8
1946	25.6	20.0	18.2
1947	31.9	25.7	22.9
1948	23.8	20.2	18.3
1949	20.2	17.0	16.4
1950	19.4	16.2	16.2

Table 2.--Percent of soil moisture on pasture land  
March 20-24, 1944 - 1950

	Ave. percent top 1 foot	Ave. percent top 3 feet	Ave. percent top 6 feet
1944	23.8	15.6	13.7
1945	31.2	27.1	22.4
1946	32.1	23.2	21.0
1947	35.4	28.0	24.7
1948	29.8	21.8	20.2
1949	27.2	17.9	16.0
1950	22.8	18.0	18.0

Hydrologic Studies - R. B. Hickey, LaFayette, Indiana.--"Work was resumed to obtain additional detailed information on field capacity (on a field basis) for soils on the experimental watersheds, along with laboratory of volume-weight determinations and pore space analyses. Samples are also being taken for chemical analyses.

"The field capacity studies are made by mulching sample plots and, after they have become saturated by spring rainfall (and supplemental irrigation, if necessary) and covering them to prevent evaporation losses, allowing the moisture to drain to equilibrium at successive depths in the profile. This work was started in the spring of 1947, and a series was run in the spring of 1949. Another series next spring will complete the survey for all watersheds in the rotation crop experiments."



Hydrologic Studies - G. A. Crabb, Jr., East Lansing, Mich. - "March 12 and 13 the Station Supervisor studied the proposed orchard management and soil-moisture research site at Traverse City, Mich., in company with Drs. A. L. Kenworthy and A. E. Erickson, of the Departments of Horticulture and Soil Science, and Professors E. H. Kidder and P. E. Schleusner, of the Department of Agriculture Engineering. Soil Conservation Service District Conservationist G. E. Springer and Soil Scientist Herman Webber participated actively in this study and were of material assistance in evaluating the problem and area. This project has been proposed because of farmer demand on the subject, but has not progressed from the tentative planning stage because of lack of funds, and further because of the lack of a clear statement of the problem and outline of attack. However, Dr. Kenworthy with the assistance of the above-named staff members and Dr. Raleigh Barlowe, of the Agricultural Economics Department, have prepared the following tentative statement of the problem and outline of solution.

"Three significant changes are appearing in commercial orchards in Michigan. One is the increased amounts of fertilizer used which contains not only nitrogen but also phosphorus and potassium. A limited survey conducted in 1948 showed that approximately 50 percent of the growers are using 'complete fertilizers' or fertilizers containing nitrogen, phosphorus, and potassium. Several growers are using a fertilizer preparation that contains many of the 'minor elements' in addition to the 'complete fertilizers.' Also, the growers are using fertilizer at a higher rate, nitrogen particularly, than has been commonly suggested. This increased usage of nitrogen averages about 40 percent above the amount heretofore suggested by the experiment Station or Extension Service. In isolated cases a grower may be applying 4 - 5 times as much nitrogen as commonly believed to be needed and appears to be getting a satisfactory response to the increased application. This increased use of fertilizers has led to the question as to whether or not the upper limits for fertilizer applications have been reached unless a supplemental measure such as irrigation is employed.

"A second significant change in the production of fruit is in the cultural management of the orchard. During recent years there has been a definite shift in management practices from clean cultivation to cover crops to sod culture. When a grower plants or establishes a sod in his orchard, he observes a reduced rate of growth and production. Mulching has been found to, in part, overcome this reduced rate of growth and production, and is being widely adapted. The survey made in 1948 indicated that 40 percent of the orchards were in sod or sod-mulch management. Over 60 percent of the apple orchards were managed by use of sod or sod-mulch while over 60 percent of the peach and cherry orchards were managed by use of cover crops and clean cultivation. The reduced rate of growth and production associated with the use of a sod culture is believed to be due largely to the utilization of moisture by the sod. Stone fruits (peaches and cherries) appear to be more susceptible to this moisture condition than apple orchards. Also, although mulching overcomes, in part, the depressing effects of sods, such material is not readily obtainable and expensive to maintain in a concentrated fruit producing district where pasture, hay, and grain fields are limited in number. This has led many growers to raise the question of the value of irrigation as a means of overcoming the depressing effects of sod culture. This brings in the third significant change in management methods used to produce fruit.

"Several growers with readily accessible sources of water have installed irrigation units. Where used, irrigation appears to be a satisfactory solution to many of the problems involved in producing large quantities of good quality fruit. However, there prevails the thought that irrigation must be combined with the

increased use of fertilizers and the use of a sod type of soil-management. The number of growers that have a source of water that is readily accessible is limited. Those growers who would have to drill wells or pipe water long distances are hesitant to install expensive irrigation facilities because no factual information is available in regard to production and quality increases associated with the improved conditions of nutrition, soil moisture, and soil structure usually associated with a production practice that combines a high level of balance between nutrient elements, sod-mulch management and irrigation. These growers are, at present, wanting information that will aid them in making the decision in regard to these various orchard practices.

"The three changes, mentioned above, apparently are taking place because the growers have not been able to obtain a desired production of high quality fruit. This lack of desired production of high quality fruit is probably due to soil depletion of various nutrient-elements and organic matter and to the lack of adequate rainfall during the growing season. The depletion of the soil organic matter and soil erosion has resulted in the soil being unable to hold as much moisture and nutrient-elements as before. Since the soil is not able to hold as much water and nutrient-elements, the effects of prolonged periods void of rains are accentuated and more noticeable than perhaps 30 years ago. Not only has the ability of a soil to hold nutrient-elements been lessened by the depletion of soil organic matter and erosion but also the amounts of naturally available nutrient-elements have been reduced. The use of only nitrogen fertilizers has also aided in the depletion of the nutrient-elements.

"Thus it would appear as though an orchard cover such as sod should be established and its growth promoted as much as possible. If the sod growth is promoted, the optimum organic level for a given soil will be reached sooner than if the sod growth is kept at a minimum. Also, if a sod is established and its growth restricted, the production of organic matter may be sufficient to only maintain the present reduced level. On the other hand, if the sod growth is promoted there is considerable competition between the sod and trees for moisture and nutrient-elements. This competition usually results in reduced tree growth and fruit production. The decomposition of organic matter produced by a rapidly growing sod should, eventually, improve the moisture and fertility of the soil enough to permit the trees to make sufficient growth. This may require as long as 10 years, and it is questionable whether the tree will ever reach the production level of orchards now growing in clean cultivation or in sods of restricted growth. This implies that in order to obtain the desired tree growth and production there must be some provision to provide larger amounts of soil moisture than is provided by rainfall. The use of a crown mulch will, in part, provide for some additional soil moisture and nutrient-elements. Irrigation offers a means of providing sufficient soil moisture for both sod and tree growth if used with or without a crown mulch.

"Irrigation of an orchard increases the ability of a tree to use more nutrient-elements. If the optimum amount of water is provided a fruit tree, the utilization or application of fertilizers may be potentially doubled and, in turn, enable Michigan fruit growers to more nearly approach the production commonly obtained in the western fruit producing areas. However, the use of either one of these two practices may cause the trees to become more susceptible to winter injury but if properly used in conjunction with one another there should be no real hazard.

"A considerable amount of work has been done with orchard irrigation in Western United States but very little has been done in the Eastern part. The research in Western United States has dealt largely with water requirements of fruit plantings but not in relation to fertilizer-water relationships. This also applies to most



of irrigation research in the Eastern States. If irrigations are applied on plantings receiving the usual amount of fertilizers, any increased growth may be assumed to be due to a shortage of soil moisture. This also implies that the grower has been using an excess of fertilizers. Conversely, if soil moisture is increased and the trees do not respond then fertilizer may be considered to be inadequate. The major problem is to increase both soil moisture and the level of nutrition until the limiting factor is the prevailing climatic conditions. This has not been established for fruit trees and isolated cases of increased fertilizer applications and/or irrigation indicates there is a possibility of increasing fruit production much above the present average.

"Before there can be any sound advice concerning the use of irrigation and fertilizers, it will be necessary to obtain information concerning the demands of various fruit crops for water at various periods throughout the growing season. Also, information is needed concerning the influence of fertilizers on water utilization as well as the influence of moisture supply upon the utilization of nutrient-elements. In regard to the growth and management of the orchard cover, information is needed concerning the ability of increased fertilizer applications and the use of irrigation to overcome the reduction in growth and production usually associated with increased sod growth.

"There is also a possibility that the types of sod covers now being used have been selected because of the naturally occurring moisture-fertilizer relationships. When optimum levels of soil moisture and nutrient-elements are available for tree growth, certain types of sod covers, perhaps a legume-like alfalfa, may be more desirable than fescue, Kentucky blue grass, or the native grasses now being used. A study of sod types should be made in conjunction with the problem outlined above.

"Methods of irrigation should also be studied. Adequate information is not available to permit sound advice to the grower concerning the use of perforated pipe vs. under-tree sprinklers vs. above-tree sprinklers vs. furrow irrigation. The effects of these methods upon soil moisture distribution, disease infestations, yield and quality of fruit and physical characteristics of the soil have not been determined.

"The grower would also need to know the economic aspects of these various methods before investing considerable capital in any program involving irrigation or fertilizer applications. At present, information is not available to help a fruit grower decide whether or not the capital investment in irrigation equipment would be returned through increased yields. Likewise, information is not available to show whether or not a sod-mulch practice is more profitable than a sod-irrigation practice.

"The above discussion indicates the need for a rather large experiment in which soil-moisture supply, nutrient-element supply, sod types, mulching materials, and methods of irrigation should be interacted with the objectives being to determine effect on: soil-moisture supply availability of soil nutrients, absorption of soil nutrients, tree growth, production, and quality of fruit, prevalence of insects and diseases, and cost of production. At present, it appears desirable to establish field plots in which a split-plot design is used in order to interact the data desired.

"Statewide coverage will be attempted in this work. Sufficient plots have been established in southwest Michigan for the present. However, rainfall records show the area around the east and west arms of the Grand Traverse Bay and the Old Mission Peninsula to be the driest of the major fruit producing areas in Michigan. After a survey of potential sites and cooperative growers, it has been thought desirable to establish the plots on the farm of Robert Seaburg on the Old



Mission Peninsula North of Traverse City.

"This description presents, in considerable detail, the problem and the envisaged solution. The personnel previously mentioned are in accord that this is one of the most pressing problems current in Michigan agriculture, and of paramount interest to orchard men, erosion control technicians, grassmen, and others. It is felt that the problem, though very wide, is of particular value in soil conservation research because upon its solution depends in large measure the response which will be met from the orchard man in controlling orchard erosion through the use of sod cover--admittedly one of the most thorough methods of preventing soil and water losses from orchards on relatively gentle slopes. Although funds for this study are not yet in sight, the full problem and proposed solution are presented in the hope that all or part of the funds will eventually become available from some source or sources, and that as much of the study as is possible be inaugurated upon the availability of funds."

Hydrologic Studies - A. W. Cooper, Auburn, Alabama.--"The level plots used in the study of the effect of tillage and residue management on the physical properties of soil were prepared for planting to their second crop of cotton. There have been no significant changes noted in the physical properties of the soil to date (treatments have been in progress for 1 year).

"Two tests were made using the new procedure worked out for determining the effect of various type storms on soil and water losses. Much time was spent in obtaining and screening soil for future tests.

"Messrs. Cooper and Richardson met Mr. Bailey in Watkinsville, Ga., on March 3 to discuss plans for cropping systems to be used on the erosion plots starting this spring and to tour the Experiment Station. It was decided to measure soil and water losses, using a 2-year and a 3-year rotation suggested by Mr. Bailey and to check the differences in soil and water losses from a high- and a low-yield corn crop, which had been suggested by Mr. Kummer.

"The 2-year rotation will be cotton, followed by reseeding crimson clover and rye grass for winter grazing, and Sudan grass for summer pasture of hay. This rotation will be put on 5 percent slopes. In order to have both years of the rotation each year and a check plot, this test will require three 5 percent slopes. It is planned to change one 2-1/2 percent slope to 5 percent to do this.

"The 3-year rotation agreed upon was cotton followed by oats with tall fescue and Ladino clover seeded immediately after the grain is drilled. The grain will be harvested and the fescue and Ladino grazed the rest of that year and the next. This will require four 10 percent plots. It is planned to change the 15 percent slopes to 10 percent.

"The check plots in both rotations will be a standard cotton, winter legumes-corn rotation.

"Corn and crimson clover will be grown on the 20 percent plots each year. One plot will receive a high rate of fertilizer to obtain a large amount of residue, and the other plot will receive a normal fertilizer application.

"In each of the studies the amount of residue returned to the plots will be measured.

"Measurements were made of the legume yields on the erosion plots (table 1 on the next page), and those plots to be planted to cotton and corn were prepared for

planting this month.

Table 1.--Legume yield on the soil erosion plots, Auburn, Ala., March 21, 1950

Plot No.	Slope Percent	Legume	Green weight per acre lb.	Dry weight per acre lb.
1	2-1/2	Crimson clover	4,853	825
2	2-1/2	" "	7,279	1,092
3	5	" "	8,250	1,073
4	5	" "	9,706	1,456
5	10	" "	4,853	874
6	10	" "	5,824	1,048
7	15	" "	10,677	1,602
8	15	Subterranean clover	19,412	3,106*
9	20	Crimson clover	9,706	1,456
10	20	Subterranean clover	17,956	2,873*

\*The dry-matter yields of subterranean clover on the 15 and 20 percent slopes were 95 percent more than those of the crimson clover on these slopes. This was not apparent by merely looking at the plots, because the crimson clover was much taller. On close examination, however, it could be noted that the subterranean clover made a much thicker mat of material on the ground. It is planned to check the soil and water losses from the 15 percent plots using artificial rainfall, since there has been no runoff from natural rains this season."

Hydrologic Studies - T. W. Edminster, Flacksburg, Virginia.--"Mr. Holtan visited the Middleburg Pasture Experiment Station to obtain basic information for design of runoff measurement system which may be used to supply the needed flood routing data for use by both Operations and Flood Control. This proposed work is in a watershed scheduled for a future flood control program and it is hoped that the early initiation of the work will supply valuable information in support of the survey program.

"On the return trip Mr. Holtan stopped at Staunton and installed rain gages on the watershed studies there. He spent 1 day at the V. T. Baber farm, Newport, Va., assisting the Soil Conservation Service in their field demonstration or as commonly called 'Face lifting' demonstration. Mr. Holtan's efforts were confined to the construction of the farm pond. Several other members of the project visited the demonstration."

Hydraulic Studies - F. W. Blaisdell, Minneapolis, Minnesota.--"Mr. Donnelly has completed all of the scheduled submergence tests on the box inlet drop spillway. These tests were begun in November 1946, and except for numerous and prolonged interruptions have continued since that time. The final analysis of the data has not yet commenced. Mr. Donnelly also obtained three head-discharge curves; several more must be obtained to complete the scheduled test program. Mr. Blaisdell has resumed the analysis of the head-discharge curves as time permits.

"During the month attention was concentrated on the East Aldrich wingwall study. The test channel was completed on March 17 and the first model was tested on

March 24. Five tests were run on two different models--both designed for a notch depth of 6 feet and a fall of 12 feet. These studies have not progressed far enough to obtain any definite conclusions; however, it was noted that considerable water splashed over the sidewall of the basin."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Georgia.-  
"Considerable time was spent on detail plans for the 1950 studies. These plans include:

I. Vegetables

1. Tomatoes, lima beans, pole beans on low land
  - a. sprinkler irrigation
  - b. no irrigation
2. Tomatoes, lima beans, pole beans on upland
  - a. sprinkler irrigation
  - b. no irrigation
3. Sweet potatoes
  - a. sprinkler irrigation
  - b. furrow irrigation
  - c. no irrigation

II. Corn

1. Sprinkler irrigation--high soil-moisture level
2. Furrow irrigation--high soil-moisture level
3. Sprinkler irrigation--low soil-moisture level
4. No irrigation
5. The use of a sprinkler irrigation system for applying liquid nitrate fertilizer.
6. The use of furrow irrigation for applying liquid nitrate fertilizer.

III. Corn--upland (at Watkinsville Station)

1. Sprinkler irrigation
2. No irrigation

IV. Cotton (at Watkinsville Station)

1. Sprinkler irrigation
2. No irrigation

V. Pastures--detail plans for the pasture studies were not completed.

VI. Sprinkler distribution tests and other miscellaneous studies."

Supplemental Irrigation Studies - T. W. Edminster, Blacksburg, Va.-"The irrigation plot lay-out was altered so that part circle sprinklers could be used. To obtain approximate uniform coverage the three laterals already located on 60-foot spacings were reduced to 50-foot spacings to meet the requirements of the selected part circle sprinklers. A third row of irrigated plots was established between the irrigated and non-irrigated plots and a fourth lateral placed on a 40-foot spacing. A smaller size sprinkler will be used on this row which will contain nine plots instead of the conventional seven."



Drainage Studies - J. C. Stephens, West Palm Beach, Florida. - "In late March 1948 a peat levee with an 18 to 24-inch limerock cap was constructed at the Wedgeworth farm near the Everglades Experiment Station along a part of the east side of Section 4, Twp. 44 S., Range 37 E. The completed levee was approximately 5 feet high with a top width of 10 feet and 1 to 1 side slopes. The average elevation was determined by levels taken along the centerline of the levee at 100-foot intervals. On March 9 of this year, these levels were rerun over the levee to determine the subsidence. The average elevation of the top of the levee in 1948 was 20.2 feet while in 1950 the average elevation of the combination peat-rock dike was 19.5 feet, or an average loss in height of 0.7 foot over the 2-year period. The landowner regraded this levee with a bulldozer immediately after our levels were return this year so that it will not be possible to continue this series of observations as was originally intended.

"The retardance coefficient 'n' was again determined this month on slope courses 'A' and 'B' on the Tamiami Canal west of Miami, which contains underwater mosses. A summary of the elements of flow obtained in March are listed in tables 1 and 2 on pages 20 and 21 along with previous flow for comparison. It appears that the value of 'n' is a function not only of the amount of growth of the mosses, but also of the average velocity of the stream. The faster the velocity the more of the channel area is freed by depression of the moss streamers, and the relation between different values of 'n' possibly may be found under such conditions to vary as some function of the VR relation obtained for flow in vegetated outlet channels described in Technical Bulletin No. 967, "Flow of Water in Channels Protected by Vegetative Linings."

"Study of previous work on seepage in the Dade County area indicates that the upper strata (Lake Flirt marl and highly crystalline limestone) which covers the permeable Miami Oolite and Tamiami limestone aquifer probably acts as a perforated lateral apron extended along the base of levees in this area and thereby affects the seepage flux  $Q/\Delta h$  to the extent of its effective distance from the base of the levee.

"The situation apparently corresponds closely to the two-dimensional problem in which flow takes place in the vertical plane, similar to the consideration of seepage under dams of lengths great as compared to their thickness. In such cases the seepage flux is determined by the ratio of the width of the impermeable dam base to the depth of the permeable aquifer.

"Three formulae which purport to evaluate the quantity of seepage under these conditions were applied to values of permeability and aquifer depths previously obtained along the Dade-Broward levee, and results compared. The formulae compared were: Muskat's, where  $Q/\Delta h = K'/2K$ , and is expressed graphically; Forchheimer's, where  $Q/\Delta h = 1/(0.86 + W/D)$  for  $W/D > 1$ ; and Terzaghi's, where  $Q/\Delta h = 1/(0.88 + W/D)$  for  $W/D > 2$ . All gave values remarkably close to each other, not varying over 10 percent at the widest divergence.

"In the above,  $Q/\Delta h$  is the seepage flux per unit potential drop across the dam or levee per unit dam length; W is the base width of the dam or levee or upper relatively impervious layer, and D is depth of the pervious strata.

"In substituting in the formulae the coefficient of permeability was taken as 50,000 G.P.D., or 2,500 Darcys, which is the average obtained by draw-down tests on wells nearby. The depth of permeable strata averages 60 feet as determined from borings. A differential head h of 1.8 ft. was assumed as this was approximately the average head on the Dade-Broward levee in 1947 and 1948 when the seepage under it was computed at about 68 to 100 c. f. s. per linear mile of levee.

Table 1.--Slope course "A" on the Tamiami Canal just west of bridge at Sweetwater, Fla.

LENGTH OF REACH TESTED: 3,000 feet

DATE OF OBSERVATION	AVERAGE MAX. DEPTH	AVG. SURFACE WIDTH	FLOW	AVG. X SECTION AREA	MEAN VELOCITY	MEAN HYDRAULIC RADIUS	SLOPE	COEFFICIENTS			ELEVATION BANK FULL STAGE	ELEVATION WATER SURFACE	ELEVATION OF BOTTOM
								Chezy C	Mann- ing n'	Kutter n			
	Ft.	Ft.	Sec. ft.	Sq. ft.	Ft.-sec.		Ft. - ft.				Ft.	Ft.	Ft.
9/29/49	9.3	51.0	197.82	395.44	0.500	6.74	0.0002667	23.69	0.0865	0.102	7.2	5.62	-3.7
2/21/50	7.6	46.9	133.13	311.80	.427	5.84	.0000433	26.86	.0743	.0853	7.2	3.90	-3.7
3/24/50	7.9	47.4	54.10	327.14	.181	6.05	.0000257	14.54	.138	.165	7.2	4.22	-3.7

DESCRIPTION OF CHANNEL: Arterial drainage canal. Course: straight, Cross section: little variation in cross section, some irregularities on side slopes and banks caused by dragline excavation and solution on holes in Miami Oolite limestone. Bottom: generally regular. Soil: Channel excavated into Miami Oolite limestone from top to bottom. Condition: Canal redredged and cleaned in spring of 1948. Aquatic mosses growing along banks extending from 5 to 8 feet into water along both edges. Little evidence of aquatic growth in center of channels.

2/21/50. Description the same except that moss appears to be less prevalent than in October.

3/24/50 Description the same except that moss growth is comparable to that during October test.

Table 2.--Slope course "B" on the Tamiami Canal just west of bridge at 119th Ave., Miami, Fla.

LENGTH OF REACH TESTED: 3,000 feet

DATE OF OBSERVATION		AVERAGE MAXIMUM DEPTH		AVERAGE SURFACE WIDTH		FLOW		AVERAGE X SECTION AREA		MEAN VELOCITY		MEAN HYDRAULIC RADIUS		SLOPE		COEFFICIENTS			ELEV. BANK FULL STAGE		ELEVATION WATER SURFACE		ELEVATION OF BOTTOM							
		Ft.		Ft.		Sec. ft.		Sq. ft.		Ft.-sec.				Ft. - ft.		Chezy C			Mann- ing n'			Kutter n			Ft.		Ft.		Ft.	
9/29/49		7.5		52.0		39.37		319.06		0.123		5.64		0.0000633		6.51			0.305			0.359			7.0		6.16		-1.3	
2/21/50		5.4		46.3		86.33		220.9		.390		4.46		.0000867		19.84			.096			.103			7.0		4.14		-1.3	
3/24/50		5.6		47.0		51.1		229.2		.225		4.53		.0000530		14.61			.132			.143			7.0		4.33		-1.3	

DESCRIPTION OF CHANNEL: Arterial drainage canal. Course: straight. Cross section: little variation in cross section. Some irregularities on side slopes and banks caused by excavation and solution holes in Miami Oolite limestone. Bottom: generally regular. Soil: channel excavated into Miami Oolite limestone from top to bottom. Condition: channel not maintained in recent years. Small brush and vegetation along north bank but mostly above water line. Channel contains heavy growth of aquatic moss from bank to bank throughout length of course.

2/21/50 Description remains the same except that aquatic moss has thinned out considerably.

3/24/50 Description remains the same except that aquatic moss has increased growth.



The seepage flux  $Q/\Delta h$  from the average of the three formulae with different assumed ratios of  $W/D$  are given below together with the corresponding seepage discharge in c. f. s. per linear mile which would result under these conditions:

Q			Q		
Ratio	$Q/\Delta h$	c.f.s. lin.mi.	Ratio	$Q/\Delta h$	c.f.s. lin.mi.
$W/D$			$W/D$		
1	0.54	404	7	0.13	96
2	.35	260	8	.11	82
3	.26	194	9	.102	76
4	.21	157	10	.092	69
5	.17	127	15	.063	47
6	.15	112	20	.050	37
			30	.033	25

"The ratio  $W/D$  of 6/1 to 10/1 gives a  $Q$  of from 112 to 69 c.f.s. which is within the limit of seepage computed in 1947 and 1948. Thus, if the above assumptions are correct it would appear that the upper strata of Lake Flirt marl would correspond to an effective impermeable apron of from 360 to 600 feet wide along the base of the levee. Under such conditions from a practical standpoint it would not be feasible to construct a rock levee with a base wide enough to influence the seepage to any appreciable extent. Nonetheless, since the upper relatively impervious strata contains vertical solution holes which probably are only partially sealed and which are widely scattered throughout the surface of the upper stratum, the blanketing action of this stratum might be improved by plowing, disking, and rolling the muck so as to render it less permeable than at present for a distance of 1,800 to 2,000 feet laterally and parallel to the proposed rock levees on the upstream side. Such a procedure would not be too costly and would theoretically reduce the seepage flux  $Q/\Delta h$  from about 0.1 to 0.033, or 67 percent. In any event it would appear that any penetration of the upper stratum on the upstream side of the levee in the close vicinity would be conducive to appreciable gains in seepage losses."

Drainage Studies - M. H. Gallatin, Homestead, Florida. - "Readings in the mulch plots showed a steady increase from the first to the middle of the period. From March 15 through March 19 0.57 inch of rain was recorded for this area. Readings after this especially in the check plot lowered rapidly but at the end of 7 days the readings were well above the wilting point for citrus. During this same period the rain did not lower the readings for the shavings mulched area. We have found that it takes over an inch of rain to penetrate the layer of shavings. Readings in the pine straw and grass mulched areas dropped after the showers of March 15 through March 19.

"The moisture studies have shown that with this continued dry period we have been experiencing, citrus and lime groves where irrigation is not practiced have gone into a permanent wilt. Our work this year further corroborates past work and that is, to maintain good moisture conditions the groves must be irrigated on a rather short cycle 6 to 8 days for limes or citrus and 8 - 12 days for avocados.

"Our studies on nitrate leaching during this period have shown that unless there is sufficient moisture high organic types of nitrogen fertilizer will remain more or less dormant. Such materials applied previous to our showers on the 15th through the 19th showed little or no breakdown. Samples taken about a week after the rains showed that the materials were breaking down.

"Samples collected from the chloride lines in the Miami area have not increased in concentration over the past month and in general are about the same as for previous years at this time.

"Samples collected in the Homestead area show that there is an increase in the concentration of chlorides. The greater increases again are being found in those areas where pumping is done out of the deep rock ditches. During this period we have been sampling throughout the contaminated area the various types of crops grown, to try to get more information on the tolerance of the crops to chlorides. We found in this work that the amount of organic matter and cultural practices played a very important part in the tolerance of crops to chlorides.

"In our past work we have found that tomato yield and maturity are seriously impaired when the concentration reaches 6,000 P. P. M. Our work this year has shown that tomatoes would grow well, mature, and produce if they were bedded. In such an area the concentration was 9,000 P. P. M. in the surface. By the bedding practice the soil was moved up in the hill and the high concentration was carried past the root zone.

"In another instance a farmer came in to tell us his tomatoes had stopped growing. Analysis of samples from this area showed a concentration of 72,000 P. P. M. in the surface crust with rather low concentration in the area 4-8 inches below the surface. It was recommended that he use a disk cultivator and work soil up around his plants. He did this and we were able to move the high concentration upward away from his plant roots and he made a good crop. It was possible to do this, this year as we had little or no rain after November 14. So the movement of chlorides was upward.

"From the little work we have been able to do this year there is no doubt that cultural practices are important in making a crop grow in concentrations that in the past have been detrimental."



# IRRIGATION AND WATER CONSERVATION DIVISION

Imperial Valley Drainage Investigations - W. W. Donnan, Los Angeles, Calif.-"One phase of the research on drainage in Imperial Irrigation District involves a check of those tile systems already installed to determine whether the tile spacing formula gives an adequate design. One phase of this program deals with the amount of flow coming from the farm tile systems during an irrigation cycle or season. The amount of water applied is measured at the headgate and the amount of water draining out of the tile system is measured using a Bradshaw-type portable flow recorder. The tile system in most instances drains out about 10 percent of the water applied. This 10 percent drainage is considered adequate to keep the salt balance in the soil at a low level. The following tabulation is a summary of eight flow tests made on tile systems in the Imperial Valley, Calif.:"

Location of field	Period of test	Input water applied	Out-flow drainage	
		to field	from tile system	
		Acre-feet	Acre-feet	Percent
Meloland Farm	1 year	66.0	4.5	6.9
Meloland Farm	1 year	76.4	6.2	8.1
Meloland Farm	6 months	23.5	2.4	9.4
Bridger Ranch	1 year	161.5	14.9	9.3
Homola Ranch	1 irrigation	6.1	0.49	8.1
Chaulupnik Ranch	1 irrigation	51.5	5.6	10.9
Suchy Ranch	1 irrigation	53.3	11.6	21.7
Whal Ranch	150 days	143.2	12.7	8.9

San Fernando Valley Investigations - G. Marvin Litz, Los Angeles, Calif.-"For the forthcoming annual report on the cooperative drainage and water requirement studies in San Fernando Valley, the assembled data were tabulated and several graphs, charts, and maps drawn and reproduced.

"The piezometer wells in the Valley were read again on March 14, 1950. The water table is at about the same elevation that it was in February, its highest elevation this season."

Water Requirements in the Southwest - H. F. Blaney, Los Angeles, Calif.-"Normal temperature and precipitation records were compiled for Arizona and New Mexico and the monthly consumptive use factors computed for some 50 stations. G. Marvin Litz assisted in this work.

"Additional irrigation data were collected by Karl Harris for Arizona and by Eldon Hanson for New Mexico, for reports being prepared on Consumptive Use of Water and Irrigation Requirements in those States. At a meeting in Phoenix on March 27, growing periods and consumptive use coefficients were set up for those reports."

Consumptive Use, Lower Colorado River Basin. - H. F. Blaney, Los Angeles, Calif.-"Studies on rates of water consumption in the Lower Colorado River Basin were continued during March. A meeting was held with representatives of the Soil Conservation Service and the Bureau of Reclamation on March 28 at Phoenix. Results of preliminary studies for comparison of consumptive use of water, as computed by the inflow-outflow method and the Blaney-Criddle method, were reviewed. Consumptive use coefficient (K), in the formulae,  $U = KF$  = consumptive use, were set up for some of the irrigated crops as follows: Alfalfa, 0.85; beans, 0.60; citrus trees, 0.60; dates, 0.65; cotton, 0.62; deciduous fruits, 0.65; grapes, 0.60; small grains, 0.70; melons, 0.65; flowers, 0.65; potatoes, 0.70; sorghum,



0.70; and, miscellaneous vegetables, 0.70."

Water Requirement Southeastern Region - H. F. Blaney, Los Angeles, Calif  
"At the request of A. Carnes, Regional Engineer of the Southeastern Region, the study of the adaption of the method of determining consumptive use from climatological data developed by research in the semi-arid areas of the West to humid conditions of the South Atlantic States, started in 1949, was expanded to include the following areas: Norfolk, Virginia; Louisville, Kentucky; Charleston, South Carolina; Birmingham, Alabama; Mobile, Alabama; and Orlando, Florida. Consumptive-use factors have been computed for these areas and work has been started on development of consumptive-use coefficients for various crops for the purpose of estimating supplemental irrigation water requirements."

Imperial Valley, Drainage Investigations - G. B. Bradshaw, Imperial, California.-"The second complete year of the Salton Seas evaporation study has been completed. This project has as its objective the determination of the amount of safe inflow of drainage waters to the Salton Sea. Since the Sea is a closed basin and it is the only outlet for drainage waste, the maintenance of the Salton Sea at a safe level becomes a problem in the over-all drainage of the Coachella and Imperial valleys. Three evaporation stations have been maintained for this study: Sandy Beach on the west side, Devils Hole on the north side and Salt Farm on the east side.

"The following is a tabulation of evaporation for 1949, by months, from the 2-foot diameter (Young-type) screen pans at the three stations:

<u>Month</u>	<u>Sandy Beach</u> <u>Inches</u>	<u>Devils Hole</u> <u>Inches</u>	<u>Salt Farm</u> <u>Inches</u>
January	4.60	2.83	2.58
February	4.21	2.70	3.09
March	7.86	5.67	5.85
April	9.95	8.55	7.33
May	13.41	11.22	10.09
June	13.25	11.91	10.57
July	14.33	13.15	12.03
August	14.09	12.91	11.53
September	12.16	10.85	10.02
October	9.53	8.25	8.59
November	5.82	4.72	4.89
December	4.33	3.37	3.45
Total	114.44	96.13	90.02

Water Spreading for Recharge of Underground Basins - A. T. Mitchelson, Dean C. Muckel, Eldred S. Bliss, Curtis E. Johnson, Berkeley, Calif.-San Joaquin Valley-"Dr. T. M. McCalla, Project Consultant, visited the Bakersfield laboratory and field experiments in order to observe our techniques and offer suggestions for improvement. During the course of his visit a medium for enumerating fungi was developed, which proved superior to the one previously used. A medium for cultivating anaerobic organisms was also tried.

"Dr. McCalla suggested two laboratory experiments to be run concurrently with present investigations. One experiment is designed to investigate the decomposition rate of various plant materials including cotton-gin trash. The other is designed to show some of the physical, chemical, and biological changes in soils as various types of plant materials decompose in them. Preparations for these

experiments are being made and they will be started as soon as possible.

"A germicidal surface-active agent called 'Oronite Quaternary Ammonium Chloride' was used in percolation tests. Five percolation tubes which had been running for a long period and had reached very low rates were used. These tubes were supplied with the Oronite compound at a concentration of 100 ppm. After 11 days these tubes had shown no appreciable change in percolation rate.

"Considerable time was spent reviewing physical and microbiological techniques developed in the laboratory. Several days were spent collecting field samples and running laboratory tests on desorption, volume weights, aggregate analysis, total microbe counts, fungus, and bacterial counts in a continuation of efforts to correlate these properties with past treatments of the ponds. As a result of these consultations several comprehensive experiments were outlined in detail. These are designed to study specifically the effect of cotton-gin trash on soil aggregation and organic matter decomposition rates.

"During the second half of the month the two concentric ponds at Wasco were put into operation. Since starting the ponds a continuous series of soil samples has been taken from a number of 20-foot deep holes radiating out from the ponds at 5-foot intervals. By means of this study we hope to determine the shape of the cone of water percolating down from the ponds toward the water table. Any changes in shape of the cone as the intake rate of the ponds changes can also be studied.

"The laboratory program was reviewed and the problems outlined according to priority. Programs of operation were written for each individual field test pond of the Minter Field and Wasco groups. The Minter Field group required an extra program of operation owing to the possibility of changing the water supply from well to canal water. It is believed proper to utilize the canal water whenever it is available and to use the well water only as a supplemental supply. Because of the difference in water qualities, different ponds are operated with different water.

"A conference was held in the Berkeley office with Prof. Kron and Dr. Thomas of the University of California Sanitary Engineering Research Project, regarding effluent from sewerage for spreading over absorptive areas for recharge. They are even studying feasibility of taking San Francisco industrial waste and sewerage water through Burlingame, San Mateo, Palo Alto, Santa Clara and San Jose, for spreading in Santa Clara Valley. They have established small spreading ponds in southern California and in San Joaquin Valley, designed from data obtained from this Division, in order to determine how deep effluent has to sink through various soils before it is free from harmful bacteria. The Berkeley office has arranged several contacts for them in southern California and in San Joaquin Valley. They are looking to us for guidance and we are fully cooperating with them informally. This is a very interesting study.

#### Performance Tests of Well Screens - C. Rohwer, Ft. Collins, Colorado.-

"Tests were completed on the losses through a 20-mesh wire gauze screen with gravel envelopes of 1/16, 1/8, 1/4, 1/2, and 1-inch gravel. Considerable loss occurred through the fine gravel which materially reduced the flow that could be obtained through the screen. The work of rescreening the gravel for the envelopes was continued.



Seepage Losses from Irrigation Channels - C. Rohwer, Ft. Collins, Colorado-"Computation of the results of the tests on the seepage rings and the SCS permeameter were completed and the data were tabulated and typed. Charts showing the variation of the seepage with time and with depth were prepared. The permeameter readings were compared with the seepage measured in the seepage rings. The comparison shows that the permeameter readings were seriously affected by the manner in which the permeameter was set in place. When it was pressed into place without jarring the readings agreed with the losses shown by the seepage rings. Plans are being made to continue the tests on the seepage rings at the Horticultural Plots as soon as the weather becomes favorable. Equipment is being obtained for installing another set of seepage rings to measure the losses on the Poudre Supply Canal of the Colorado-Big Thompson Project.

"Definite progress has been made on the plans for drilling of test holes to determine the feasibility and location of a drainage well. The Regional Salinity Laboratory, BPI, have indicated their willingness to give assistance when actual drilling is started. There is also some indication that the Public Service Co. of Colorado may give some financial assistance on the drainage project.

"Work is proceeding on an irrigation system to serve the test plots on Mesa College Farm. These plots were mentioned in last month's report.

Irrigation and Drainage Research in Utah - G. D. Clyde, Logan, Utah.-

"Vaughn E. Hansen made a trip to the Southwest. This will require about a month. C. W. Lauritzen reports that in connection with the studies on Lining of Irrigation Canals and Ditches that final arrangements for a field test in cooperation with the Wilson Irrigation Company at Ogden, Utah, have been completed. Some asphalt and earth linings are planned for installation during the fall months or some time in 1951. The construction costs of this test will be financed primarily by the Wilson Irrigation Company, with contributions from the American Gunitite Company, Inc., Salt Lake City, Utah, and E. V. Briscoe & Son of Kerman, Calif. The Production and Marketing Administration has approved this project for Agricultural Conservation Payments and the Company will receive approximately \$1,200.00 from this source.

"An inspection of the Richmond Field Test on March 23, showed all the experimental linings to be in good condition except the butyl coated fiberglass which had been damaged by livestock in crossing the channel. It was agreed that this would be removed, patched, and replaced as a buried membrane for further testing. The gravel covered bentonite section of lining, which was later topped with a rock rip rap to protect it from erosion is scheduled to be replaced by concrete. The lining is still intact and is probably effective in reducing seepage loss but the extreme roughness, together with some restriction in cross section resulting from the addition of rock rip rap, has caused a back water condition in the channel above, which is undesirable.

"At the request of the Richmond Irrigation Company, our Field Test of 1948 is being extended to include some buried asphaltic membrane lining. The nature and extent of this installation is yet to be determined.

"Work was begun on preparing the pipeline intake to experimental channels at the River Laboratory and relocation of the drain. Since the College purchased the adjacent land, relocation is possible to improve the grade. This relocation should improve the operation of the channels."



Snow Survey Studies - B. Peterson, Phoenix, Arizona.-"Snowfall during the past season has been far below normal. The Verde and Salt River drainage areas had about one-third normal snow cover. The Gila River drainage area had one-fifth of normal. As of April 1, 1950, there is practically no snow remaining on the watersheds of the State. Because of these poor snow conditions, the stream-flow into the State's principal reservoirs has been disappointing. The Verde peaked at about 2,500 cubic feet per second, but only for a couple of days. The Salt never did peak, but has constantly run between 400 and 700 cubic feet per minute for about 2 months. The Gila River flow has been so low that the water users have been constantly drawing on storage out of the San Carlos Reservoir.

"As of April 1, the reservoir storage in the State is 20 percent of capacity. The storage would be far below this, had there not been a good runoff in 1949."

Snow Survey Studies - H. J. Stockwell, Ft. Collins, Colorado.-"The Snow Reports based on March 1 snow surveys were prepared for the Rio Grande, Platte-Arkansas and Colorado River Basins, by March 10. Press releases for Colorado, Wyoming and New Mexico on the water-supply outlook were written and released through the Agricultural Extension Services of the respective States. The water-supply outlook for this area is approximately normal except for the Rio Grande and Arkansas Rivers. On these watersheds the 1950 irrigation watershed supply is expected to be somewhat less than normal. Limited reports for April 1 indicate that conditions similar to March 1 reports still exist. April 1 snow surveys on the Rio Grande and New Mexico indicate that the runoff will be very low. Many snow courses have the lowest measurements since the snow surveys were started in 1937.

"A paper was prepared for the 'All Engineer's Conference' in New Mexico on the subject of 'Snow Surveys in Western United States.' This was presented at this meeting on March 31. It will be published in the magazine entitled 'The New Mexico Professional Engineer and Contractor.'

"Another paper was prepared for the Colorado River Water Forecast Committee Meeting at Boulder City, April 17, 1950, on the subject 'Proposed Extension of the Snow Survey Network in Colorado.' During the last week of the month snow surveys were made on six courses in Southern Colorado and Northern New Mexico. Final programs for the Rio Grande and Colorado River Forecast Committee Meetings were prepared and mailed to interested parties."

Snow Survey Studies - M. Nelson, Boise, Idaho.-"During the first part of March, eight separate snow surveys were made on the Boise and Payette Drainages by the Boise office personnel. The March 1 report entitled, 'Snow Surveys and Irrigation Water Forecasts for Columbia Basin' was prepared and distributed to some 350 subscribers. As of March 1 the water supply for the Columbia Basin this coming summer is expected to be generally good to excellent. Some areas such as the Kootenai and Spokane River Drainages in northern Idaho and the Flathead River in western Montana show a relatively heavy snow cover and high flow may occur along these streams. As of the last of March, indications are that the snow pack has increased more than normal over much of the Columbia Basin. It is possible that high water may occur in a number of drainages as a result of this heavy March snow accumulation."

Snow Survey Studies - A. R. Codd, Bozeman, Montana.-"The March 1 snow survey and irrigation water-supply forecast bulletin covering March 1 snow-survey data, consumed the first 10 days of March. Data collected and analyzed for February indicated a 'fair' water supply for the coming seasons. April 1 measurements on hand at the present time show an above-average increase for the month of March. This increase has brought the prospects from a 'fair' supply to a 'good'

water supply. Most stations, at reasonable elevations that were below average, are now 100 percent or better.

"The Upper Columbia River appears to have excellent water-supply prospects. Measurements on hand at present indicate that the Upper Flathead is well above average, while the Upper Clarks Fork is average or above.

"On March 23 the writer left headquarters for a field trip to north central Wyoming to investigate the possibility of increasing the snow-survey course network in the Big Horn Mountains on tributaries of the Tongue and Powder Rivers. This work was requested by the Bureau of Reclamation, Region 6, Project Planning and Reservoir Regulation Sections. After interviewing the heads of these sections at Billings, Montana, interviews were had with the U. S. Forest Service and Geological Survey offices at Sheridan, Wyoming. In order to plan and determine the feasibility of a snow tractor route to the proposed sites for snow courses, an airplane reconnaissance flight was made over the area. Three sites were selected and the following 2 days were spent in laying out and measuring two courses. It was deemed that the other site would be more economically reached by airplane. As a result, another flight was made using a light plane equipped with skis and an over-powered motor. With this machine, landings were made within short skiing distance of three snow-survey courses. Measurements were made and the return to the airport within 3 hours; actual flying time, 1 hour. This work would have taken two men with a sno-cat, 4 or 5 days to accomplish. These sites were in isolated regions and judging from the economy and the increased morale of the surveyors, there appears to be great possibilities in servicing some snow-survey courses by light airplane. In the future, the location of new courses or re-location of old courses will have this method of travel considered. The importance of flying weather cannot be overlooked as the most and all-important factor. The surveyor and pilot will have to work close together and go when conditions permit.

"The last week in March was spent in preparation of the April 1 snow-survey bulletin and for the second annual meeting of the Upper Missouri River Water Forecase Committee meeting to be held in Helena, Montana, on April 11, 1950, in the Montana Power Company auditorium at 8:30 a. m."

Snow-Survey Studies - Clyde Houston, Reno, Nevada, - "March's storms have brought the snow stored water in Nevada and the Eastern Sierra so much above average that there is very little likelihood of a shortage in irrigation season water supplies this coming summer. However, storage reservoirs are low and any excess streamflow will go towards replenishment as insurance for future drought years.

Research-Operations-Extension Work - Ivan D. Wood, Ft. Collins, Colorado - "Mr. Wood assisted in conducting Irrigation Schools for farmers at the following cities in Kansas: Meade, Sublette, Jetmore, and Ness City. Attendance at these schools averaged 36 at the morning sessions, 40 at the afternoon sessions, and one school was held only in the evening, with an attendance of 152 farmers.

"An Irrigation School for technicians of Region 3 was held at Milwaukee, Wis., March 13-15, 1950. The audience consisted mostly of GS-9 Engineers, at this school intensive work was given on land preparation and water-application methods.

"A school was held at Las Cruces, N. Mex., for technicians at the New Mexico State College. There were 44 in attendance.



"He also assisted in conducting irrigation schools held at Riberia, N. Mex.; Namba, Colo.; and Albuquerque, N. Mex. An irrigation demonstration was given on the Schwartzman farm. This group made a tour of the Indian Boys Home.

Assistance to Operations - H. F. Blaney, Berkeley, California.-"At the request of A. Carnes, Regional Engineer of the Southeastern Region, the study of the adaption of the method of determining consumptive use from climatological data developed by research in the semi-arid areas of the West to humid conditions of the South Atlantic States, started in 1949, was expanded to include the following areas: Norfolk, Va.; Louisville, Ky.; Charleston, S. C.; Birmingham, Ala.; Mobile, Ala.; and Orlando, Fla. Consumptive-use factors have been computed for those areas and work has been started on development of consumptive-use coefficients for various crops for the purpose estimating supplemental irrigation water requirements."

Assistance to Operations - N. P. Swanson, Amarillo, Tex.-"A meeting was held with Operations personnel to discuss problems relating to the irrigation field studies and irrigation efficiency studies being made in the Hale and Swisher Soil Conservation Districts."

Assistance to Operations - S. J. Mech, Prosser, Washington.- "I visited the Walla Walla and the Yakima Work Group offices on March 22 and 24, respectively. Discussions of the problems and answers in soil and water conservation were mutually beneficial. The meeting at Yakima was a regularly scheduled staff meeting, with the added presence of State and Regional office personnel. These included the Regional Engineer, Regional Personnel Officer, Assistant State Conservationist, and a Zone Technician."

Surface and Sprinkler Irrigation Studies - W. D. Criddle, Boise, Idaho.- "During the month of March, Mr. Davis, who is handling both the surface and sprinkler irrigation studies on the Black Canyon Experimental Area in southwestern Idaho directed most of his efforts towards planning this coming summer's operation and gathering equipment necessary to conduct the irrigation studies. Plans have been prepared for the construction of a small pump house at the site in order that the motor pump and necessary tools can be locked up. It is expected that this small house or shed will be constructed early next month.

Consumptive Use of Water - W. D. Criddle, Boise, Idaho.-"During the month a final draft of a report entitled, 'Irrigation Water Requirements in Nevada' prepared by Clyde Houston of our Reno office was reviewed. It is expected that this report will be published as a Nevada Experiment Station bulletin in the near future.

"Also, work is well under way on a similar report for the State of Wyoming. Mr. Criddle held a conference with Byron Tomlinson of the Division of Irrigation, SCS office at Laramie, Wyoming, and Guy Woodward of the Wyoming Extension Service regarding the progress of this report. It is expected that a draft will be completed within the next month or so. This report will give the estimated amount of water consumed in each of the irrigated areas of the State of Wyoming.

"Also during the month two papers were prepared by Mr. Criddle on consumptive use. One was presented at the Pacific Coast Section Meeting of the ASAE in Salt Lake City on March 18. The other is to be presented at the spring meeting of the ASCE in Los Angeles on April 26.



Irrigation Studies - W. R. Meyer, Garden City, Kansas.-"The first of the month, Mr. Ben Grover reported to the station to replace Mr. Wieland as Irrigation Agronomist.

"Much of the time this month was spent irrigating. All of the beet ground was irrigated. A 6-inch application was applied. The ground has now been worked down and after floating the beets will be drilled.

"On the small fertility plots the wheat, barley, and alfalfa were irrigated. Most all of the plots took from 5 to 6 inches of water.

"A large number of green bugs were noticed on the wheat but as yet no damage has been done. Also a large number of pea aphids were observed on alfalfa. The alfalfa is looking good and is beginning to grow.

"All of the alfalfa plots on Field G have just been irrigated. Soil samples were taken before irrigation and 2 days after irrigation. The efficiencies as yet have not been calculated but they will probably be somewhat better than those obtained last year.

"The past 2 or 3 weeks have been quite windy with the evaporation running as high as 0.3 inch per day.

"More core samples were taken and permeabilities were run. The following table gives the results of a series of three replicated samples taken in Field D which is now in wheat.

Depth in Inches	Permeability in In/hr.
5" - 7"	0.158
10" - 13"	.166
15" - 18"	.234
20" - 23"	.057
25" - 28"	lost
31" - 34"	.488
36" - 38"	.125
41" - 44"	.402

Irrigation Studies - F. B. Hamilton, Lincoln, Nebraska.-"Progress on the development of a well-equipped Irrigation Research area at the North Platte Experiment Station has been good. Tentative commitments by commercial concerns have been made to the University on 1,300 feet of surface pipe with necessary coupling devices. Two water meters have been ordered. These facilities will be available this season for use in our 'Methods of Application of Irrigation Water' project.

"A talk on 'Intake of Water in Furrow Irrigation' was given at the York County Irrigation Clinic at the request of the Extension Irrigation Engineer.

Irrigation Requirements for New Mexico - E. G. Hanson, State College, New Mexico.-"Approximately one-third of March was devoted to computing and tabulating data relative to the irrigation requirements of various crops in the irrigated areas of New Mexico. The Blaney-Criddle method is being used as the basis for the computations.

Irrigation Trials. - "Six sites on private farms have been staked and soil sampling has been commenced to study irrigation efficiencies and to measure the moisture depletion under cotton throughout the growing season."

Irrigation Studies - M. P. Swanson, Amarillo, Texas.-"No precipitation was received during March leaving the total precipitation for the past 6 months at 1.94 inches, about 3.4 inches below normal for the period.

"A plot of wheat was irrigated from a contour ditch on March 6. A high wind developed and prevented proper water spreading. It is believed that as much as 40 percent of the 4-inch irrigation was lost to the atmosphere during application since no ponding occurred at the lower side of the plot (0.3 percent slope) and only 70 percent of the area was wetted. Plots with similar moisture contents, irrigated before and after this plot, have soaked up 3 inches or less of water in the same length of time. Moisture could be felt in the air on the leeward side of the plot during irrigation. This plot was reirrigated on March 16 with a 3-inch application which wetted all areas and some ponding resulted. The total gain in moisture storage in the 0 to 36-inch depth was 2.3 inches of water.

Irrigation Studies - S. J. Mech, Prosser, Washington.-"The season is continuing about 2 weeks behind that of last year. Frosty nights are delaying spring growth of trees and other perennials. The planting of early crops like beets, potatoes, and grains is well under way throughout the Yakima Valley.

"Plowing for corn experiments was completed and the plots were re-located for 1950. Installation of the irrigation and measuring equipment will begin soon. It is expected that the corn will be planted before the end of April.

"A comprehensive report entitled 'Sugar Beet Irrigation Experiments' covering the results of our 1949 experimentation was completed. It consists of a short narrative together with a larger number of figures and tables. Only a limited distribution of this report was made, but a wider distribution will be made through Mr. G. D. Clyde's office.

"My paper entitled 'Infiltration and Its Relation to Soil and Water Conservation Under Irrigation' originally presented before the Northwest Science Association in December 1947, was re-submitted for publication in Northwest Science. The Editor, in a letter regarding its re-submission, notified me that he will reserve its chronological priority from the date of its original receipt. Delay and irregular publication of this Journal was attributed to printing difficulties.

"I visited the Walla Walla and the Yakima Work Group offices on March 22 and 24, respectively. Discussions of the problems and answers in soil and water conservation were mutually beneficial. The meeting at Yakima was a regularly scheduled staff meeting, with the added presence of State and Regional office personnel. These included the Regional Engineer, Regional Personnel Officer, Assistant State Conservationist, and a Zone Technician."

5/12/50